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Screening for Colonization with *Klebsiella pneumoniae* Carbapenemase Producing *Enterobacteriaceae* in the Emergency Department of a NYC Medical Center Using a Prototype Multiplex PCR Assay

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INTRODUCTION

Since first described in 2001, *Klebsiella pneumoniae* carbapenemase producing *Enterobacteriaciae* have rapidly disseminated on a global basis. NYC experienced numerous outbreaks in 2004 and is now considered endemic for KPC.[1,2] Prevalence is suspected to be high among both acute and long term care facilities in the region, and the inter-institutional transfer of KPC colonized patients is believed to be a driving force for the ongoing epidemic.

Previous work at the 700 bed Moses Division Hospital, one of the four hospitals in the Montefiore Medical Center (MMC) network in the Bronx, N.Y., identified peri-rectal KPC colonization among 4% of adult inpatients, with patient colonization rates of up to 9% in several inpatient units[(3)]. KPC peri-rectal colonization was strongly associated with admission from a long term care facility and exposure to antibiotics in the previous 3 months.

OBJECTIVES

Study objectives included:

1.Investigation of the prevalence of KPC peri-rectal colonization among Moses Division Emergency Department (ED) patients prior to their admission to inpatient units

2.Identify risk factors associated with KPC colonization among these patients, and

3.Explore potential strategies for KPC screening in the Emergency Department

METHODS

Setting

ED of the 700 bed Moses Division Hospital of Montefiore Medical Center, an academic tertiary care facility in the Bronx, N.Y. This study was approved by the Montefiore Medical Center IRB.

Patient Selection

All adult patients (>18 years old) evaluated and admitted, but not yet transferred to inpatient clinical units during March 10 – 24, 2011 and November 21 – 28, 2011.

Patient Sampling and Analysis

A peri-rectal swab was obtained from all patients in the ED meeting inclusion criteria using a BBL ™ CultureSwab ™. For patients with a rectal tube or colostomy, the collection bag was swabbed. Direct swabs were analyzed using an experimental prototype real time multiplex PCR assay with primers for all known KPC variants ($bla_{\text{KPC ½}}$ to $bla_{\text{KPC 11}}$). The assay was optimized to run on a Rota Gene 6000 PCR platform (Corbett Research) and had been previously validated in a head to head comparison with culture.[3] All PCR runs included positive and negative controls.

Patient Data Collection

Patient data was collected for all sampled patients via chart review and direct patient/caregiver interview and included demographic information, admitting diagnosis, DNR status, co-morbidities, history of prior admission to an acute care hospital or long term care facility within the three months prior to ED presentation. Type and duration of antibiotic use in the three months prior to ED presentation was also recorded. Co-morbidities included chronic heart failure (CHF), coronary artery disease (CAD), chronic kidney disease (CKD), cirrhosis, cancer, dementia, diabetes (DM), chronic obstructive pulmonary disease (COPD) and stroke.

RESULTS

5/300 patients (1.7%) were KPC positive. Univariate analysis identified age >75 years (p=0.002), long term care residence (p<0.01), DNR status (p=0.008), antibiotic use in prior 3 months (p=0.003) and dementia (p<0.01) as risk factors. Multivariate logistic regression identified recent hospitalization (acute care, rehab or long term care) as a risk factor [OR-7.3 (3.24-16.45)]. Additional selective sampling has now identified admission of KPC colonized patients from 11 different LTCFs and 3 different acute care hospitals.

Demographics of Patients Colonized with KPC

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age	82	89	61	88	88
Gender	Male	Female	Male	Female	Male
Admitted from	Nursing Home	Nursing Home	Home	Home	Nursing Home
PMH	CAD, COPD, Prostate Ca, CKD	CHF, COPD, DM, Dementia, Stroke	DM, Colon Ca	CHF, Dementia	DM, Prostate Ca
Abx use	Zosyn, Cefepime,	Ceftriaxone, Moxifloxacin, Zosyn	Augmentin, Gentamicin	Ceftriaxone	Moxifloxacin, Zosyn
Hospitalization within 3mo	Yes (1)	Yes (5)	Yes (1)	Yes(1)	Yes (1)
DNR Status	No	Yes	No	No	No
Admission Reason	UTI/Pneumonia	UTI/Pneumonia	Recurrent UTI	Lethargy, AMS	Stroke Code

CONCLUSIONS

- KPC patient colonization is widespread among NYC hospitals and both acute care facilities and LTCFs are reservoirs
- KPC prevalence among adult ED patients prior to admission was 1.7%
- Inter-institutional transfer of colonized patients contributed significantly to MMC's total inpatient KPC colonization prevalence (previously determined to be 4%[i])
- Screening of previously hospitalized patients in the ED would identify 100% of KPC+ patients and require PCR screening of 2141 patients on an annualized basis – further research is required to determine if this approach would be cost effective

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DISCLOSURE

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